Figure 1

Name of Photolithographic Mask	Process Steps
Mask 1: N-Well	Starting Material : P- Bulk Silicon
	Oxidation (Initial oxide)
	Photo
	N-Type Implant (N-Well)
	Diffusion
Mask 2: Active Area	Oxide Etch
	Oxidation (Subnitox)
	Silicon Nitride Deposition (CVD)
	Photo
	Nitride Etch
Mask 3: P-Field	Photo
	P-Type Implant (P-Field)
	Blanket N-Type Implant (N-Field)
	Oxidation (Field Oxide)
	Nitride Etch
	Oxide Etch
	Oxidation (Pre-Gate Oxide)
Mask 5: VTP Adjust	Oxide Etch
	Oxidation (Gate Oxide)
	Photo
	P-Type Implant (VTP Adjust)
Mask 6: Polysilicon Gate Patterning	Polysilicon Gate Deposition (CVD)
	Polysilicon Doping
	Photo
	Polysilicon Etch
Mask 10: N+ Implant	Oxidation and Diffusion
	Polysilicon Oxidation
	Photo
	N-Type Implant (N+)
Mask 11: P+ Implant	Photo
	P-Type Implant (P+)
Mask 12: Contacts	SG/PSG/SOG (Oxide) Deposition
	Diffusion
	Photo
	Contact Etch
Mask 13: Metal 1	Ti/TiN Deposition with Oxidation
	Aluminium Alloy Deposition
	Photo
	Metal Etch
	Dielectric and SOG (Oxide) Deposition
Mask 14: Vias	Photo
	Vias Etch
Mask 15: Metal 2	Ti/TiN Deposition with Oxidation
	Aluminium Alloy Deposition
	Photo
	Metal Etch
	Oxide / Nitride Deposition
Mask 16: Passivation	Photo
	Oxide Etch

Figure 2

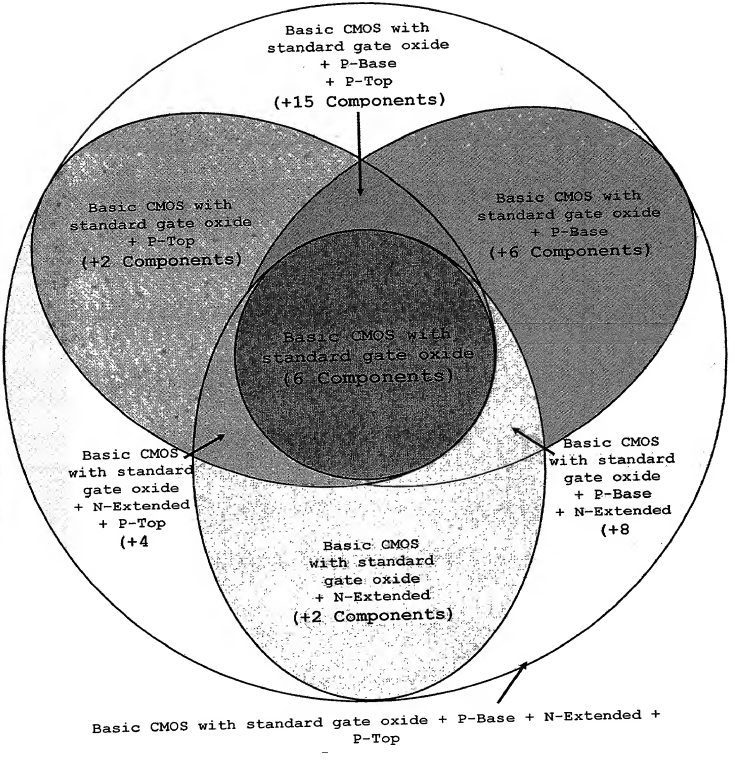

Basic CMOS with standard gate oxide + P-Base + P-Top (+15 Components)
Basic CMOS with standard gate oxide + P-Top (+2 Components)
Basic CMOS with standard gate oxide + P-Base (+6 Components)
Basic CMOS with standard gate oxide (6 Components)
Basic CMOS with standard gate oxide + N-Extended + P-Top (+4
Basic CMOS with standard gate oxide + P-Base + N-Extended (+8
Basic CMOS with standard gate oxide + N-Extended (+2 Components)
Basic CMOS with standard gate oxide + P-Base + N-Extended + P-Top

Figure 3

Name of Photolithographic Mask	Process Steps
Mask 1: N-Well	Starting Material - P- Bulk Silicon
	Oxidation (Initial oxide)
	Photo
	N-Type Implant (N-Well)
	Diffusion
Mask 2: Active Area	Oxide Etch
	Oxidation (Subnitox)
	Silicon Nitride Deposition (CVD)
	Photo
	Nitride Etch
Mask 3: P-Field	Photo
	P-Type Implant (P-Field)
	Blanket N-Type Implant (N-Field)
	Oxidation (Field Oxide)
	Nitride Etch
	Oxide Etch
	Oxidation (Pre-Gate Oxide)
Mask 5: Thin Gate oxide & VTP Adjust	Oxide Etch
	Oxidation (Thin Gate Oxide)
	Photo
	P-Type Implant (VTP Adjust)
Mask 6: Polysilicon Gate Patterning	Polysilicon Gate Deposition (CVD)
	Polysilicon Doping
	Photo
	Polysilicon Etch
Mask 8: N-Extended	Photo
	N-Type Implant (N-Extended)
Mask 10: N+ Implant	Oxidation and Diffusion
	Polysilicon Oxidation
	Photo
	N-Type Implant (N+)
Mask 11: P+ Implant	Photo
	P-Type Implant (P+)
Mask 12: Contacts	SG/PSG/SOG (Oxide) Deposition
	Diffusion
	Photo
	Contact Etch
Mask 13: Metal 1	Ti/TiN Deposition with Oxidation
	Aluminium Alloy Deposition
	Photo
	Metal Etch
	Dielectric and SOG (Oxide) Deposition
Mask 14: Vias	Photo
	Vias Etch
Mask 15: Metal 2	Ti/TiN Deposition with Oxidation
	Aluminium Alloy Deposition
	Photo
	Metal Etch
	Oxide / Nitride Deposition
Mask 16: Passivation	Photo
	Oxide Etch

Figure 4

Name of Photolithographic Mask	Process Steps
Mask 1: N-Well	Starting Material : P- Bulk Silicon
	Oxidation (Initial oxide)
	Photo
	N-Type Implant (N-Well)
	Diffusion
Mask 2: Active Area	Oxide Etch
	Oxidation (Subnitox)
	Silicon Nitride Deposition (CVD)
	Photo
	Nitride Etch
Mask 3: P-Field	Photo
	P-Type Implant (P-Field)
	Blanket N-Type Implant (N-Field)
	Oxidation (Field Oxide)
	Nitride Etch
	Oxide Etch
	Oxidation (Pre-Gate Oxide)
Mask 5: Thin Gate oxide & VTP Adjust	Oxide Etch
	Oxidation (Thin Gate Oxide)
	Photo
	P-Type Implant (VTP Adjust)
Mask 6: Polysilicon Gate Patterning	Polysilicon Gate Deposition (CVD)
	Polysilicon Doping
	Photo
	Polysilicon Etch
Mask 9: P-Top	Photo
	P-Type Implant (P-Top)
Mask 10: N+ Implant	Oxidation and Diffusion
	Polysilicon Oxidation
	Photo
	N-Type Implant (N+)
Mask 11: P+ Implant	Photo
	P-Type Implant (P+)
Mask 12: Contacts	SG/PSG/SOG (Oxide) Deposition
	Diffusion
	Photo
	Contact Etch
Mask 13: Metal 1	Ti/TiN Deposition with Oxidation
	Aluminium Alloy Deposition
	Photo
	Metal Etch
	Dielectric and SOG (Oxide) Deposition
Mask 14: Vias	Photo
	Vias Etch
Mask 15: Metal 2	Ti/TiN Deposition with Oxidation
	Aluminium Alloy Deposition
	Photo
	Metal Etch
	Oxide / Nitride Deposition
Mask 16: Passivation	Photo
	Oxide Etch

Figure 5

Name of Photolithographic Mask	Process Steps
Mask 1: N-Well	Starting Material : P- Bulk Silicon
	Oxidation (Initial oxide)
	Photo
	N-Type Implant (N-Well)
	Diffusion
Mask 2: Active Area	Oxide Etch
	Oxidation (Subnitox)
	Silicon Nitride Deposition (CVD)
	Photo
	Nitride Etch
Mask 3: P-Field	Photo
	P-Type Implant (P-Field)
	Blanket N-Type Implant (N-Field)
	Oxidation (Field Oxide)
	Nitride Etch
	Oxide Etch
	Oxidation (Pre-Gate Oxide)
Mask 5: Thin Gate oxide & VTP Adjust	Oxide Etch
	Oxidation (Thin Gate Oxide)
	Photo
	P-Type Implant (VTP Adjust)
Mask 6: Polysilicon Gate Patterning	Polysilicon Gate Deposition (CVD)
	Polysilicon Doping
	Photo
	Polysilicon Etch
Mask 8: N-Extended	Photo
	N-Type Implant (N-Extended)
Mask 9: P-Top	Photo
	P-Type Implant (P-Top)
Mask 10: N+ Implant	Oxidation and Diffusion
	Polysilicon Oxidation
	Photo
	N-Type Implant (N+)
Mask 11: P+ Implant	Photo
	P-Type Implant (P+)
Mask 12: Contacts	SG/PSG/SOG (Oxide) Deposition
	Diffusion
	Photo
	Contact Etch
Mask 13: Metal 1	Ti/TiN Deposition with Oxidation
	Aluminium Alloy Deposition
	Photo
	Metal Etch
	Dielectric and SOG (Oxide) Deposition
Mask 14: Vias	Photo
	Vias Etch
Mask 15: Metal 2	Ti/TiN Deposition with Oxidation
	Aluminium Alloy Deposition
	Photo
	Metal Etch
	Oxide / Nitride Deposition
Mask 16: Passivation	Photo
	Oxide Etch

Figure 6

Name of Photolithographic Mask	Process Steps
Mask 1: N-Well	Starting Material : P- Bulk Silicon
	Oxidation (Initial oxide)
	Photo
	N-Type Implant (N-Well)
	Diffusion
Mask 2: Active Area	Oxide Etch
	Oxidation (Subnitox)
	Silicon Nitride Deposition (CVD)
	Photo
	Nitride Etch
Mask 3: P-Field	Photo
	P-Type Implant (P-Field)
	Blanket N-Type Implant (N-Field)
	Oxidation (Field Oxide)
	Nitride Etch
	Oxide Etch
	Oxidation (Pre-Gate Oxide)
Mask 5: Thin Gate oxide & VTP Adjust	Oxide Etch
	Oxidation (Thin Gate Oxide)
	Photo
	P-Type Implant (VTP Adjust)
Mask 6: Polysilicon Gate Patterning	Polysilicon Gate Deposition (CVD)
	Polysilicon Doping
	Photo
	Polysilicon Etch
Mask 7: P-Base	Photo
	P-Type Implant (P-Base)
Mask 10: N+ Implant	Oxidation and Diffusion
	Polysilicon Oxidation
	Photo
	N-Type Implant (N+)
Mask 11: P+ Implant	Photo
	P-Type Implant (P+)
Mask 12: Contacts	SG/PSG/SOG (Oxide) Deposition
	Diffusion
	Photo
	Contact Etch
Mask 13: Metal 1	Ti/TiN Deposition with Oxidation
	Aluminium Alloy Deposition
	Photo
	Metal Etch
	Dielectric and SOG (Oxide) Deposition
Mask 14: Vias	Photo
	Vias Etch
Mask 15: Metal 2	Ti/TiN Deposition with Oxidation
	Aluminium Alloy Deposition
	Photo
	Metal Etch
	Oxide / Nitride Deposition
Mask 16: Passivation	Photo
	Oxide Etch

Figure 7

Name of Photolithographic Mask	Process Steps
Mask 1: N-Well	Starting Material : P- Bulk Silicon
	Oxidation (Initial oxide)
	Photo
	N-Type Implant (N-Well)
	Diffusion
Mask 2: Active Area	Oxide Etch
	Oxidation (Subnitox)
	Silicon Nitride Deposition (CVD)
	Photo
	Nitride Etch
Mask 3: P-Field	Photo
	P-Type Implant (P-Field)
	Blanket N-Type Implant (N-Field)
	Oxidation (Field Oxide)
	Nitride Etch
	Oxide Etch
	Oxidation (Pre-Gate Oxide)
Mask 5: Thin Gate oxide & VTP Adjust	Oxide Etch
	Oxidation (Thin Gate Oxide)
	Photo
	P-Type Implant (VTP Adjust)
Mask 6: Polysilicon Gate Patterning	Polysilicon Gate Deposition (CVD)
	Polysilicon Doping
	Photo
	Polysilicon Etch
Mask 7: P-Base	Photo
	P-Type Implant (P-Base)
Mask 8: N-Extended	Photo
	N-Type Implant (N-Extended)
Mask 10: N+ Implant	Oxidation and Diffusion
	Polysilicon Oxidation
	Photo
	N-Type Implant (N+)
Mask 11: P+ Implant	Photo
	P-Type Implant (P+)
Mask 12: Contacts	SG/PSG/SOG (Oxide) Deposition
	Diffusion
	Photo
	Contact Etch
Mask 13: Metal 1	Ti/TiN Deposition with Oxidation
	Aluminium Alloy Deposition
	Photo
	Metal Etch
	Dielectric and SOG (Oxide) Deposition
Mask 14: Vias	Photo
	Vias Etch
Mask 15: Metal 2	Ti/TiN Deposition with Oxidation
	Aluminium Alloy Deposition
	Photo
	Metal Etch
	Oxide / Nitride Deposition
Mask 16: Passivation	Photo
	Oxide Etch

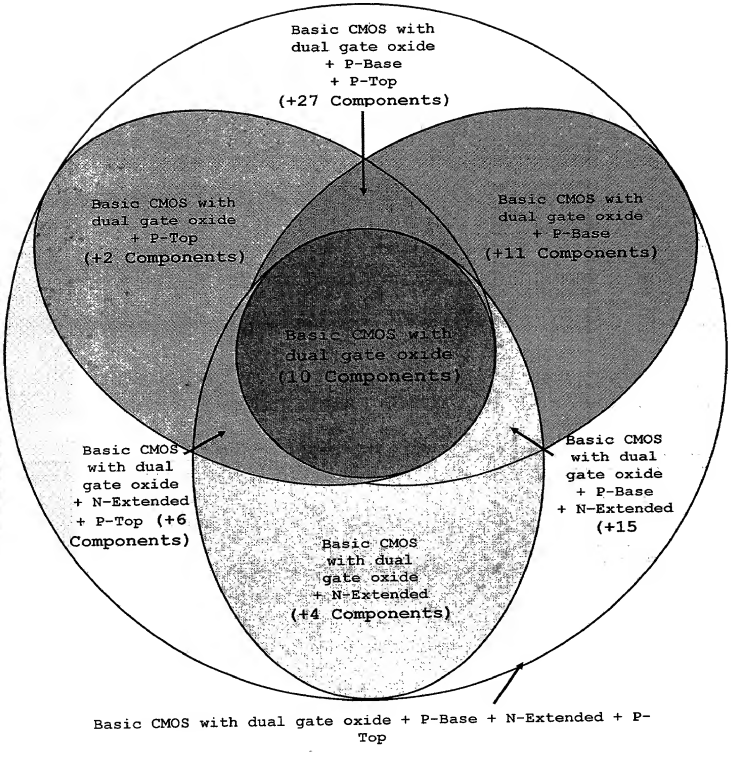
Figure 8

Name of Photolithographic Mask	Process Steps
Mask 1: N-Well	Starting Material : P- Bulk Silicon
	Oxidation (Initial oxide)
	Photo
	N-Type Implant (N-Well)
	Diffusion
Mask 2: Active Area	Oxide Etch
	Oxidation (Subnitox)
	Silicon Nitride Deposition (CVD)
	Photo
	Nitride Etch
Mask 3: P-Field	Photo
	P-Type Implant (P-Field)
	Blanket N-Type Implant (N-Field)
	Oxidation (Field Oxide)
	Nitride Etch
	Oxide Etch
	Oxidation (Pre-Gate Oxide)
Mask 5: Thin Gate oxide & VTP Adjust	Oxide Etch
	Oxidation (Thin Gate Oxide)
	Photo
	P-Type Implant (VTP Adjust)
Mask 6: Polysilicon Gate Patterning	Polysilicon Gate Deposition (CVD)
	Polysilicon Doping
	Photo
	Polysilicon Etch
Mask 7: P-Base	Photo
	P-Type Implant (P-Base)
Mask 8: P-Top	Photo
	P-Type Implant (P-Top)
Mask 10: N+ Implant	Oxidation and Diffusion
	Polysilicon Oxidation
	Photo
	N-Type Implant (N+)
Mask 11: P+ Implant	Photo
	P-Type Implant (P+)
Mask 12: Contacts	SG/PSG/SOG (Oxide) Deposition
	Diffusion
	Photo
	Contact Etch
Mask 13: Metal 1	Ti/TiN Deposition with Oxidation
	Aluminium Alloy Deposition
	Photo
	Metal Etch
	Dielectric and SOG (Oxide) Deposition
Mask 14: Vias	Photo
	Vias Etch
Mask 15: Metal 2	Ti/TiN Deposition with Oxidation
	Aluminium Alloy Deposition
	Photo
	Metal Etch
	Oxide / Nitride Deposition
Mask 16: Passivation	Photo
	Oxide Etch

Figure 9

Name of Photolithographic Mask	Process Steps
Mask 1: N-Well	Starting Material : P- Bulk Silicon
	Oxidation (Initial oxide)
	Photo
	N-Type Implant (N-Well)
	Diffusion
Mask 2: Active Area	Oxide Etch
	Oxidation (Subnitox)
	Silicon Nitride Deposition (CVD)
	Photo
	Nitride Etch
Mask 3: P-Field	Photo
	P-Type Implant (P-Field)
	Blanket N-Type Implant (N-Field)
	Oxidation (Field Oxide)
	Nitride Etch
	Oxide Etch
	Oxidation (Pre-Gate Oxide)
Mask 5: Thin Gate oxide & VTP Adjust	Oxide Etch
	Oxidation (Thin Gate Oxide)
	Photo
	P-Type Implant (VTP Adjust)
Mask 6: Polysilicon Gate Patterning	Polysilicon Gate Deposition (CVD)
	Polysilicon Doping
	Photo
	Polysilicon Etch
Mask 7: P-Base	Photo
	P-Type Implant (P-Base)
Mask 8: N-Extended	Photo
	N-Type Implant (N-Extended)
Mask 9: P-Top	Photo
	P-Type Implant (P-Top)
Mask 10: N+ Implant	Oxidation and Diffusion
	Polysilicon Oxidation
	Photo
	N-Type Implant (N+)
Mask 11: P+ Implant	Photo
	P-Type Implant (P+)
Mask 12: Contacts	SG/PSG/SOG (Oxide) Deposition
	Diffusion
	Photo
	Contact Etch
Mask 13: Metal 1	Ti/TiN Deposition with Oxidation
	Aluminium Alloy Deposition
	Photo
	Metal Etch
	Dielectric and SOG (Oxide) Deposition
Mask 14: Vias	Photo
	Vias Etch
Mask 15: Metal 2	Ti/TiN Deposition with Oxidation
	Aluminium Alloy Deposition
	Photo
	Metal Etch
	Oxide / Nitride Deposition
Mask 16: Passivation	Photo
	Oxide Etch

Figure 10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Basic CMOS with dual gate oxide + P-Top (+2 Components)
Basic CMOS with dual gate oxide + P-Base (+11 Components)
Basic CMOS with dual gate oxide (10 Components)
Basic CMOS with dual gate oxide + N-Extended + P-Top (+6 Components)
Basic CMOS with dual gate oxide + P-Base + N-Extended (+15
Basic CMOS with dual gate oxide + N-Extended (+4 Components)
Basic CMOS with dual gate oxide + P-Base + N-Extended + P-Top

Figure 11

Name of Photolithographic Mask	Process Steps
Mask 1: N-Well	Starting Material : P- Bulk Silicon
	Oxidation (Initial oxide)
	Photo
	N-Type Implant (N-Well)
	Diffusion
Mask 2: Active Area	Oxide Etch
	Oxidation (Subnitox)
	Silicon Nitride Deposition (CVD)
	Photo
	Nitride Etch
Mask 3: P-Field	Photo
	P-Type Implant (P-Field)
	Blanket N-Type Implant (N-Field)
	Oxidation (Field Oxide)
	Nitride Etch
	Oxide Etch
	Oxidation (Pre-Gate Oxide)
Mask 4: High-voltage Gate Oxide	Oxide Etch
	Oxidation (High-voltage Gate Oxide)
	Photo
Mask 5: Thin Gate oxide & VTP Adjust	Oxide Etch
	Oxidation (Thin Gate Oxide)
	Photo
	P-Type Implant (VTP Adjust)
Mask 6: Polysilicon Gate Patterning	Polysilicon Gate Deposition (CVD)
	Polysilicon Doping
	Photo
	Polysilicon Etch
Mask 10: N+ Implant	Oxidation and Diffusion
	Polysilicon Oxidation
	Photo
	N-Type Implant (N+)
Mask 11: P+ Implant	Photo
	P-Type Implant (P+)
Mask 12: Contacts	SG/PSG/SOG (Oxide) Deposition
	Diffusion
	Photo
	Contact Etch
Mask 13: Metal 1	Ti/TiN Deposition with Oxidation
	Aluminium Alloy Deposition
	Photo
	Metal Etch
	Dielectric and SOG (Oxide) Deposition
Mask 14: Vias	Photo
	Vias Etch
Mask 15: Metal 2	Ti/TiN Deposition with Oxidation
	Aluminium Alloy Deposition
	Photo
	Metal Etch
	Oxide / Nitride Deposition
Mask 16: Passivation	Photo
	Oxide Etch

Figure 12

Name of Photolithographic Mask	Process Steps
Mask 1: N-Well	Starting Material : P- Bulk Silicon
	Oxidation (Initial oxide)
	Photo
	N-Type Implant (N-Well)
	Diffusion
Mask 2: Active Area	Oxide Etch
	Oxidation (Subnitox)
	Silicon Nitride Deposition (CVD)
	Photo
	Nitride Etch
Mask 3: P-Field	Photo
	P-Type Implant (P-Field)
	Blanket N-Type Implant (N-Field)
	Oxidation (Field Oxide)
	Nitride Etch
	Oxide Etch
	Oxidation (Pre-Gate Oxide)
Mask 4: High-voltage Gate Oxide	Oxide Etch
	Oxidation (High-voltage Gate Oxide)
	Photo
Mask 5: Thin Gate oxide & VTP Adjust	Oxide Etch
	Oxidation (Thin Gate Oxide)
	Photo
	P-Type Implant (VTP Adjust)
Mask 6: Polysilicon Gate Patterning	Polysilicon Gate Deposition (CVD)
	Polysilicon Doping
	Photo
	Polysilicon Etch
Mask 9: P Top	Photo
	P-Type Implant (P-Top)
Mask 10: N+ Implant	Oxidation and Diffusion
	Polysilicon Oxidation
	Photo
	N-Type Implant (N+)
Mask 11: P+ Implant	Photo
	P-Type Implant (P+)
Mask 12: Contacts	SG/PSG/SOG (Oxide) Deposition
	Diffusion
	Photo
	Contact Etch
Mask 13: Metal 1	Ti/TiN Deposition with Oxidation
	Aluminium Alloy Deposition
	Photo
	Metal Etch
	Dielectric and SOG (Oxide) Deposition
Mask 14: Vias	Photo
	Vias Etch
Mask 15: Metal 2	Ti/TiN Deposition with Oxidation
	Aluminium Alloy Deposition
	Photo
	Metal Etch
	Oxide / Nitride Deposition
Mask 16: Passivation	Photo
	Oxide Etch

Figure 13

Name of Photolithographic Mask	Process Steps
Mask 1: N-Well	Starting Material : P- Bulk Silicon
	Oxidation (Initial oxide)
	Photo
	N-Type Implant (N-Well)
	Diffusion
Mask 2: Active Area	Oxide Etch
	Oxidation (Subnitox)
	Silicon Nitride Deposition (CVD)
	Photo
	Nitride Etch
Mask 3: P-Field	Photo
	P-Type Implant (P-Field)
	Blanket N-Type Implant (N-Field)
	Oxidation (Field Oxide)
	Nitride Etch
	Oxide Etch
	Oxidation (Pre-Gate Oxide)
Mask 4: High-voltage Gate Oxide	Oxide Etch
	Oxidation (High-voltage Gate Oxide)
	Photo
Mask 5: Thin Gate oxide & VTP Adjust	Oxide Etch
	Oxidation (Thin Gate Oxide)
	Photo
	P-Type Implant (VTP Adjust)
Mask 6: Polysilicon Gate Patterning	Polysilicon Gate Deposition (CVD)
	Polysilicon Doping
	Photo
	Polysilicon Etch
Mask 8: N-Extended	Photo
	N-Type Implant (N-Extended)
Mask 10: N+ Implant	Oxidation and Diffusion
	Polysilicon Oxidation
	Photo
	N-Type Implant (N+)
Mask 11: P+ Implant	Photo
	P-Type Implant (P+)
Mask 12: Contacts	SG/PSG/SOG (Oxide) Deposition
	Diffusion
	Photo
	Contact Etch
Mask 13: Metal 1	Ti/TiN Deposition with Oxidation
	Aluminium Alloy Deposition
	Photo
	Metal Etch
	Dielectric and SOG (Oxide) Deposition
Mask 14: Vias	Photo
	Vias Etch
Mask 15: Metal 2	Ti/TiN Deposition with Oxidation
	Aluminium Alloy Deposition
	Photo
	Metal Etch
	Oxide / Nitride Deposition
Mask 16: Passivation	Photo
	Oxide Etch

Figure 14

Name of Photolithographic Mask	Process Steps
Mask 1: N-Well	Starting Material : P- Bulk Silicon
	Oxidation (Initial oxide)
	Photo
	N-Type Implant (N-Well)
	Diffusion
Mask 2: Active Area	Oxide Etch
	Oxidation (Subnitox)
	Silicon Nitride Deposition (CVD)
	Photo
	Nitride Etch
Mask 3: P-Field	Photo
	P-Type Implant (P-Field)
	Blanket N-Type Implant (N-Field)
	Oxidation (Field Oxide)
	Nitride Etch
	Oxide Etch
	Oxidation (Pre-Gate Oxide)
Mask 4: High-voltage Gate Oxide	Oxide Etch
	Oxidation (High-voltage Gate Oxide)
	Photo
Mask 5: Thin Gate oxide & VTP Adjust	Oxide Etch
	Oxidation (Thin Gate Oxide)
	Photo
	P-Type Implant (VTP Adjust)
Mask 6: Polysilicon Gate Patterning	Polysilicon Gate Deposition (CVD)
	Polysilicon Doping
	Photo
	Polysilicon Etch
Mask 8: N-Extended	Photo
	N-Type Implant (N-Extended)
Mask 9: P-Top	Photo
	P-Type Implant (P-Top)
Mask 10: N+ Implant	Oxidation and Diffusion
	Polysilicon Oxidation
	Photo
	N-Type Implant (N+)
Mask 11: P+ Implant	Photo
	P-Type Implant (P+)
Mask 12: Contacts	SG/PSG/SOG (Oxide) Deposition
	Diffusion
	Photo
	Contact Etch
Mask 13: Metal 1	Ti/TiN Deposition with Oxidation
	Aluminium Alloy Deposition
	Photo
	Metal Etch
	Dielectric and SOG (Oxide) Deposition
Mask 14: Vias	Photo
	Vias Etch
Mask 15: Metal 2	Ti/TiN Deposition with Oxidation
	Aluminium Alloy Deposition
	Photo
	Metal Etch
	Oxide / Nitride Deposition
Mask 16: Passivation	Photo
	Oxide Etch

Figure 15

Name of Photolithographic Mask	Process Steps
Mask 1: N-Well	Starting Material : P- Bulk Silicon
	Oxidation (Initial oxide)
	Photo
	N-Type Implant (N-Well)
	Diffusion
Mask 2: Active Area	Oxide Etch
	Oxidation (Subnitox)
	Silicon Nitride Deposition (CVD)
	Photo
	Nitride Etch
Mask 3: P-Field	Photo
	P-Type Implant (P-Field)
	Blanket N-Type Implant (N-Field)
	Oxidation (Field Oxide)
	Nitride Etch
	Oxide Etch
	Oxidation (Pre-Gate Oxide)
Mask 4: High-Voltage Gate Oxide	Oxide Etch
	Oxidation (High-voltage Gate Oxide)
	Photo
Mask 5: Thin Gate oxide & VTP Adjust	Oxide Etch
	Oxidation (Thin Gate Oxide)
	Photo
	P-Type Implant (VTP Adjust)
Mask 6: Polysilicon Gate Patterning	Polysilicon Gate Deposition (CVD)
	Polysilicon Doping
	Photo
	Polysilicon Etch
Mask 7: P-Base	Photo
	P-Type Implant (P-Base)
Mask 10: N+ Implant	Oxidation and Diffusion
	Polysilicon Oxidation
	Photo
	N-Type Implant (N+)
Mask 11: P+ Implant	Photo
	P-Type Implant (P+)
Mask 12: Contacts	SG/PSG/SOG (Oxide) Deposition
	Diffusion
	Photo
	Contact Etch
Mask 13: Metal 1	Ti/TiN Deposition with Oxidation
	Aluminium Alloy Deposition
	Photo
	Metal Etch
	Dielectric and SOG (Oxide) Deposition
Mask 14: Vias	Photo
	Vias Etch
Mask 15: Metal 2	Ti/TiN Deposition with Oxidation
	Aluminium Alloy Deposition
	Photo
	Metal Etch
	Oxide / Nitride Deposition
Mask 16: Passivation	Photo
	Oxide Etch

Figure 16

Name of Photolithographic Mask	Process Steps
Mask 1: N-Well	Starting Material : P- Bulk Silicon
	Oxidation (Initial oxide)
	Photo
	N-Type Implant (N-Well)
	Diffusion
Mask 2: Active Area	Oxide Etch
	Oxidation (Subnitox)
	Silicon Nitride Deposition (CVD)
	Photo
	Nitride Etch
Mask 3: P-Field	Photo
	P-Type Implant (P-Field)
	Blanket N-Type Implant (N-Field)
	Oxidation (Field Oxide)
	Nitride Etch
	Oxide Etch
	Oxidation (Pre-Gate Oxide)
Mask 4: High-voltage Gate Oxide	Oxide Etch
	Oxidation (High-voltage Gate Oxide)
	Photo
Mask 5: Thin Gate oxide & VTP Adjust	Oxide Etch
	Oxidation (Thin Gate Oxide)
	Photo
	P-Type Implant (VTP Adjust)
Mask 6: Polysilicon Gate Patterning	Polysilicon Gate Deposition (CVD)
	Polysilicon Doping
	Photo
	Polysilicon Etch
Mask 7: P-Base	Photo
	P-Type Implant (P-Base)
Mask 8: N-Extended	Photo
	N-Type Implant (N-Extended)
Mask 10: N+ Implant	Oxidation and Diffusion
	Polysilicon Oxidation
	Photo
	N-Type Implant (N+)
Mask 11: P+ Implant	Photo
	P-Type Implant (P+)
Mask 12: Contacts	SG/PSG/SOG (Oxide) Deposition
	Diffusion
	Photo
	Contact Etch
Mask 13: Metal 1	Ti/TiN Deposition with Oxidation
	Aluminium Alloy Deposition
	Photo
	Metal Etch
	Dielectric and SOG (Oxide) Deposition
Mask 14: Vias	Photo
	Vias Etch
Mask 15: Metal 2	Ti/TiN Deposition with Oxidation
	Aluminium Alloy Deposition
	Photo
	Metal Etch
	Oxide / Nitride Deposition
Mask 16: Passivation	Photo
	Oxide Etch

Figure 17

Name of Photolithographic Mask	Process Steps
Mask 1: N-Well	Starting Material : P- Bulk Silicon
	Oxidation (Initial oxide)
	Photo
	N-Type Implant (N-Well)
	Diffusion
Mask 2: Active Area	Oxide Etch
	Oxidation (Subnitox)
	Silicon Nitride Deposition (CVD)
	Photo
	Nitride Etch
Mask 3: P-Field	Photo
	P-Type Implant (P-Field)
	Blanket N-Type Implant (N-Field)
	Oxidation (Field Oxide)
	Nitride Etch
	Oxide Etch
	Oxidation (Pre-Gate Oxide)
Mask 4: High-voltage Gate Oxide	Oxide Etch
	Oxidation (High-voltage Gate Oxide)
	Photo
Mask 5: Thin Gate oxide & VTP Adjust	Oxide Etch
	Oxidation (Thin Gate Oxide)
	Photo
	P-Type Implant (VTP Adjust)
Mask 6: Polysilicon Gate Patterning	Polysilicon Gate Deposition (CVD)
	Polysilicon Doping
	Photo
	Polysilicon Etch
Mask 7: P-Base	Photo
	P-Type Implant (P-Base)
Mask 8: P-Top	Photo
	P-Type Implant (P-Top)
Mask 10: N+ Implant	Oxidation and Diffusion
	Polysilicon Oxidation
	Photo
	N-Type Implant (N+)
Mask 11: P+ Implant	Photo
	P-Type Implant (P+)
Mask 12: Contacts	SG/PSG/SOG (Oxide) Deposition
	Diffusion
	Photo
	Contact Etch
Mask 13: Metal 1	Ti/TiN Deposition with Oxidation
	Aluminium Alloy Deposition
	Photo
	Metal Etch
	Dielectric and SOG (Oxide) Deposition
Mask 14: Vias	Photo
	Vias Etch
Mask 15: Metal 2	Ti/TiN Deposition with Oxidation
	Aluminium Alloy Deposition
	Photo
	Metal Etch
	Oxide / Nitride Deposition
Mask 16: Passivation	Photo
	Oxide Etch

Figure 18

Name of Photolithographic Mask	Process Steps
Mask 1: N-Well	Starting Material : P- Bulk Silicon
	Oxidation (Initial oxide)
	Photo
	N-Type Implant (N-Well)
	Diffusion
Mask 2: Active Area	Oxide Etch
	Oxidation (Subnitox)
	Silicon Nitride Deposition (CVD)
	Photo
	Nitride Etch
Mask 3: P-Field	Photo
	P-Type Implant (P-Field)
	Blanket N-Type Implant (N-Field)
	Oxidation (Field Oxide)
	Nitride Etch
	Oxide Etch
	Oxidation (Pre-Gate Oxide)
Mask 4: High-voltage Gate Oxide	Oxide Etch
	Oxidation (High-voltage Gate Oxide)
	Photo
Mask 5: Thin Gate oxide & VTP Adjust	Oxide Etch
	Oxidation (Thin Gate Oxide)
	Photo
	P-Type Implant (VTP Adjust)
Mask 6: Polysilicon Gate Patterning	Polysilicon Gate Deposition (CVD)
	Polysilicon Doping
	Photo
	Polysilicon Etch
Mask 7: P-Base	Photo
	P-Type Implant (P-Base)
Mask 8: N-Extended	Photo
	N-Type Implant (N-Extended)
Mask 9: P-Top	Photo
	P-Type Implant (P-Top)
Mask 10: N+ Implant	Oxidation and Diffusion
	Polysilicon Oxidation
	Photo
	N-Type Implant (N+)
Mask 11: P+ Implant	Photo
	P-Type Implant (P+)
Mask 12: Contacts	SG/PSG/SOG (Oxide) Deposition
	Diffusion
	Photo
	Contact Etch
Mask 13: Metal 1	Ti/TiN Deposition with Oxidation
	Aluminium Alloy Deposition
	Photo
	Metal Etch
	Dielectric and SOG (Oxide) Deposition
Mask 14: Vias	Photo
	Vias Etch
Mask 15: Metal 2	Ti/TiN Deposition with Oxidation
	Aluminium Alloy Deposition
	Photo
	Metal Etch
	Oxide / Nitride Deposition
Mask 16: Passivation	Photo
	Oxide Etch

Figure 19a

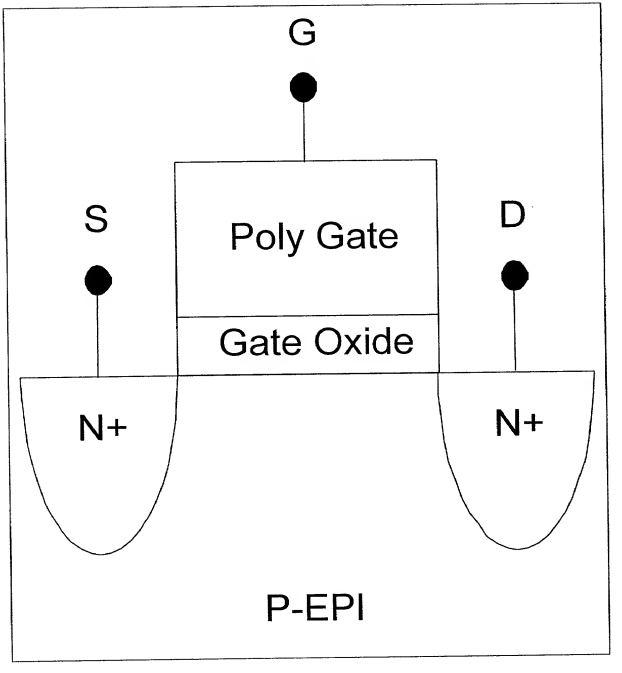
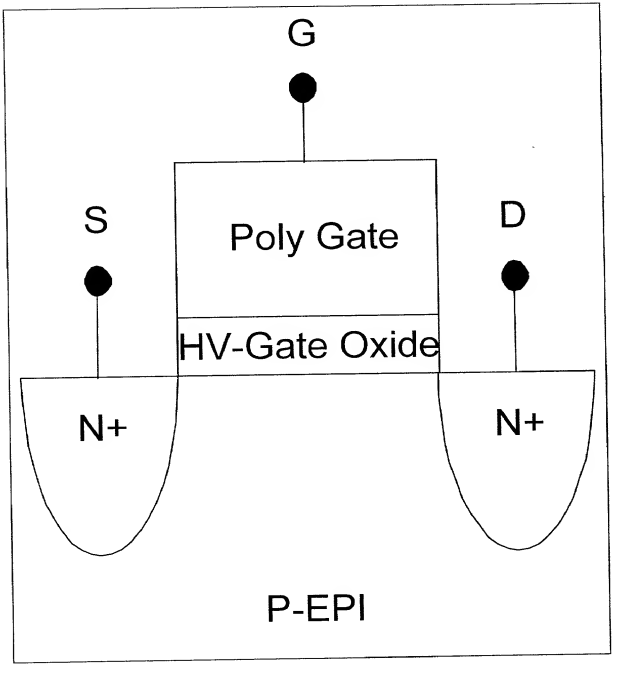


Figure 19b



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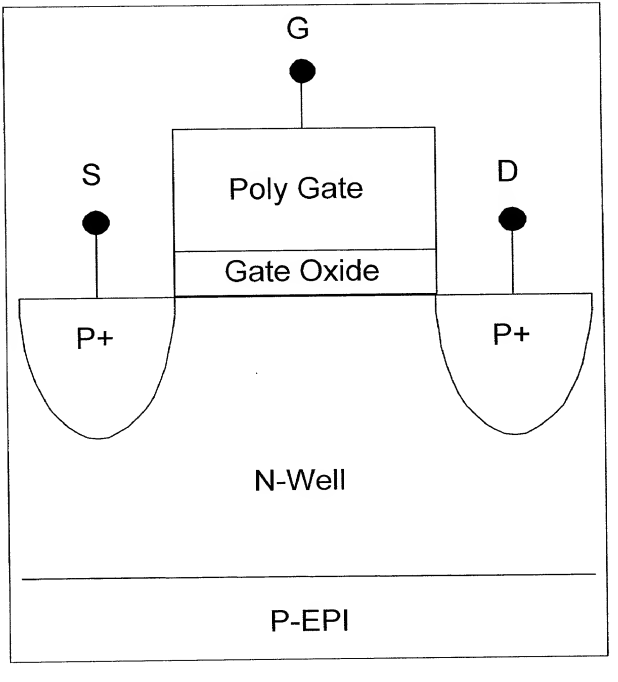


Figure 20b

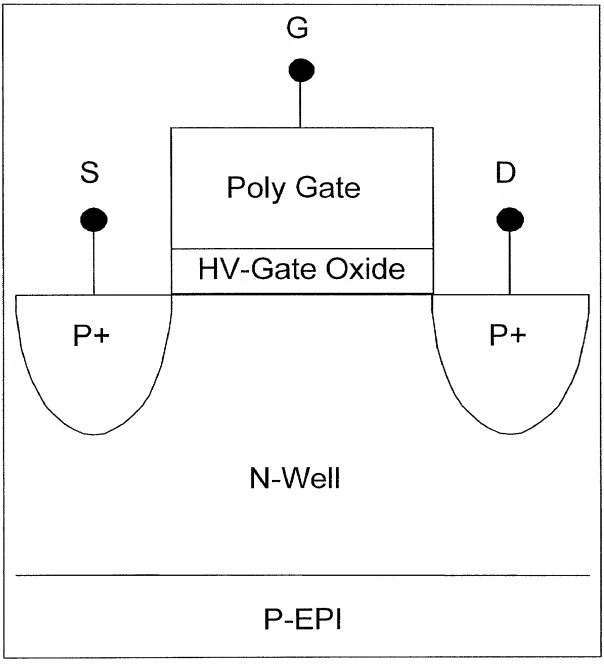


Figure 21a

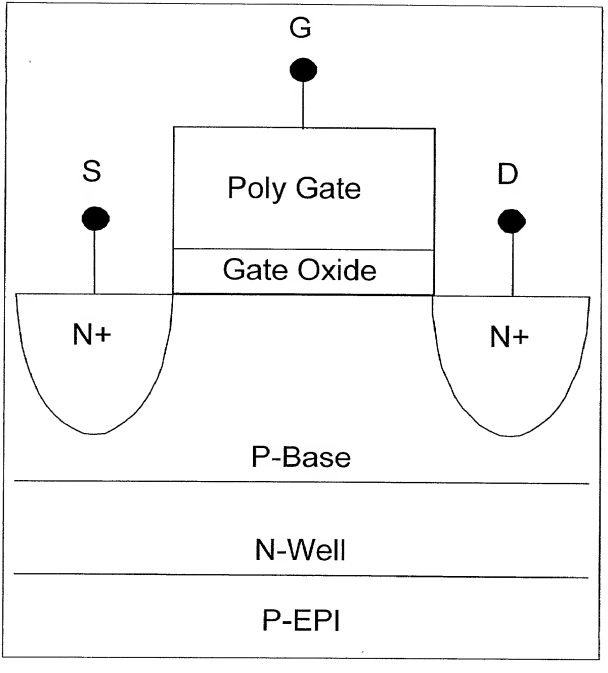


Figure 21b

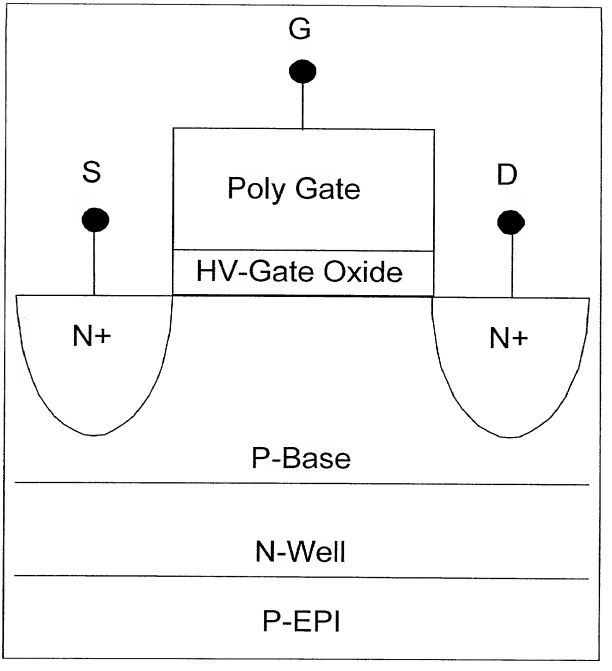
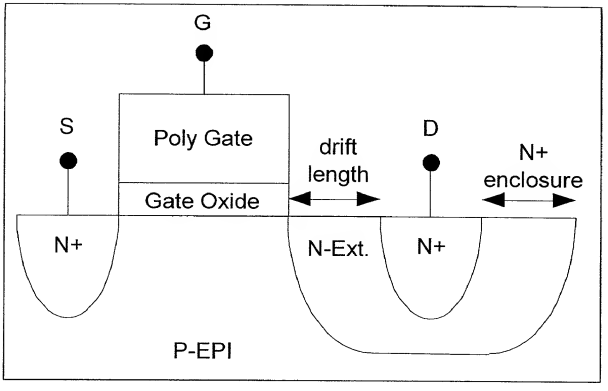


Figure 22a



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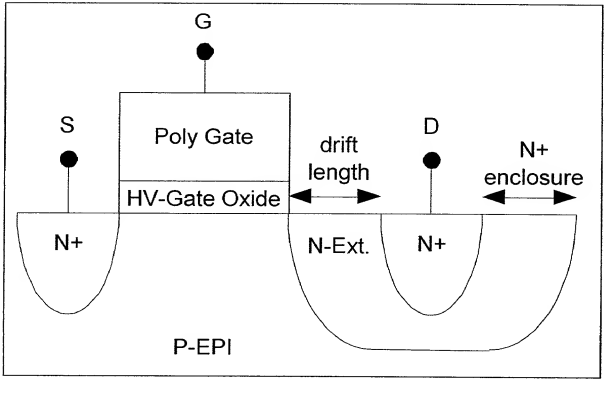


Figure 23a

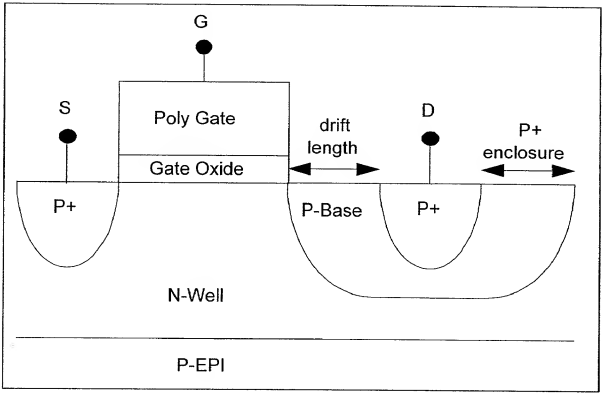
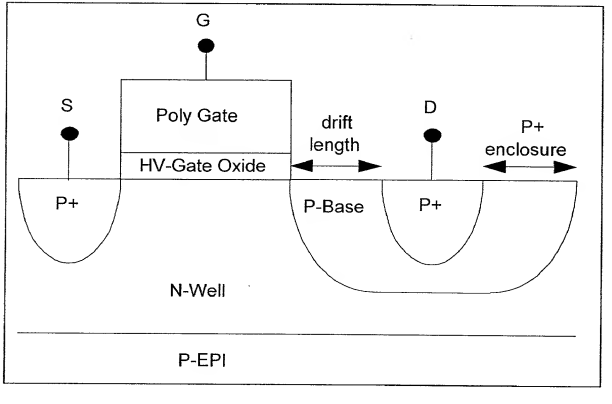


Figure 23b



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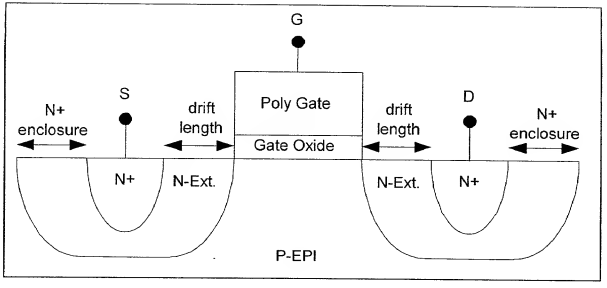


Figure 24b

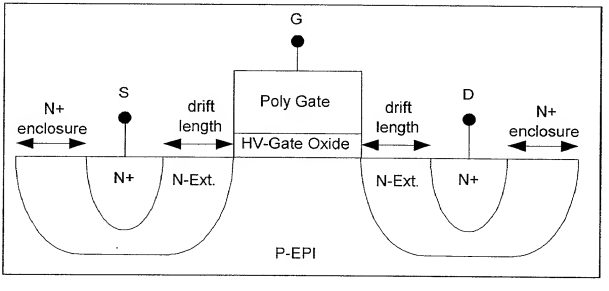


Figure 25a

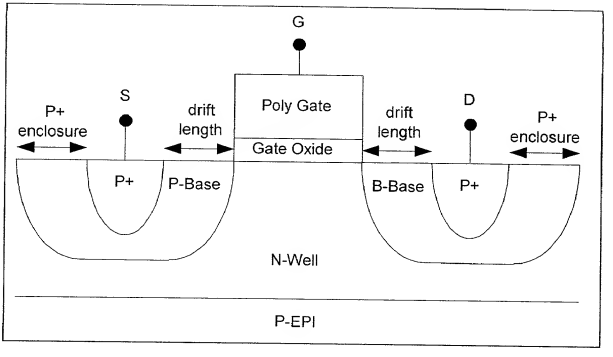
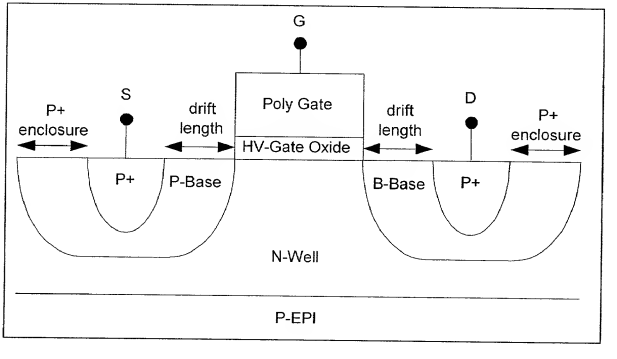


Figure 25b



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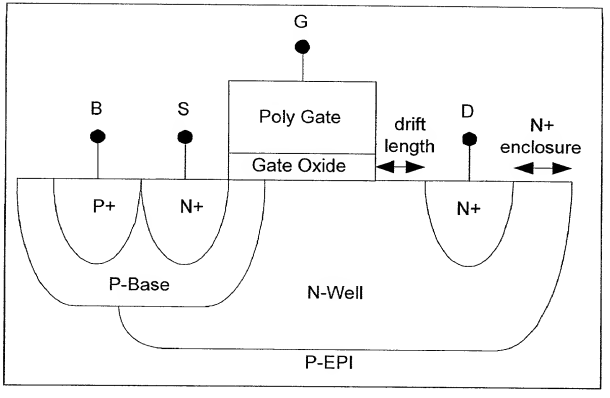

Figure 26b

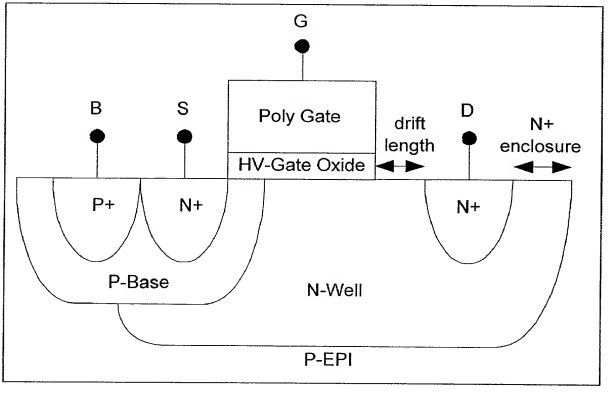

Figure 27a

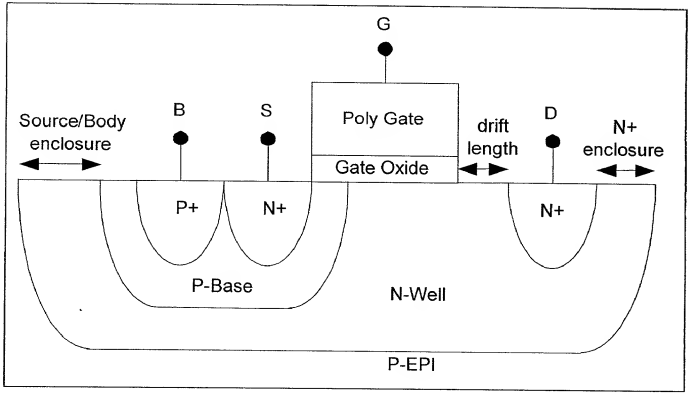

Figure 27b

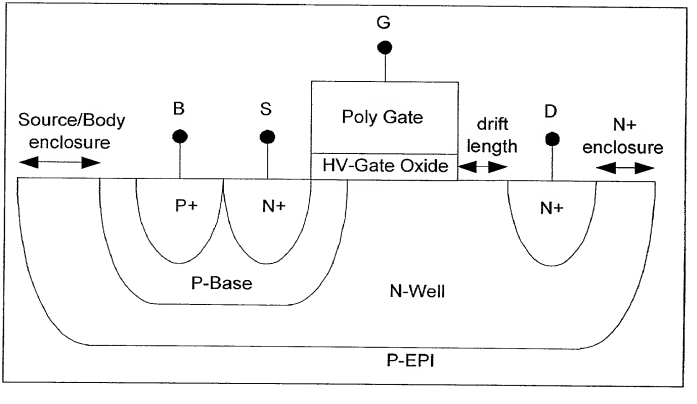

Figure 28a

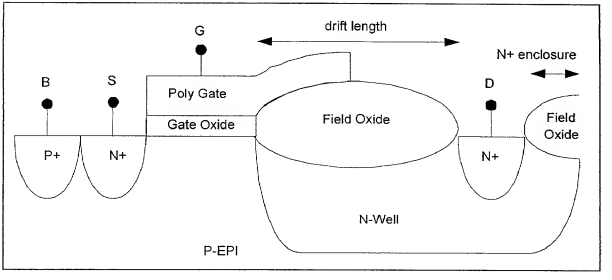

Figure 28b

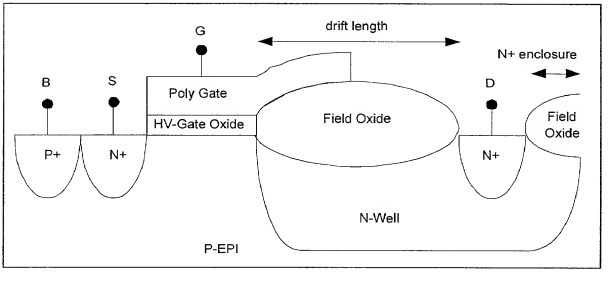

Figure 29a

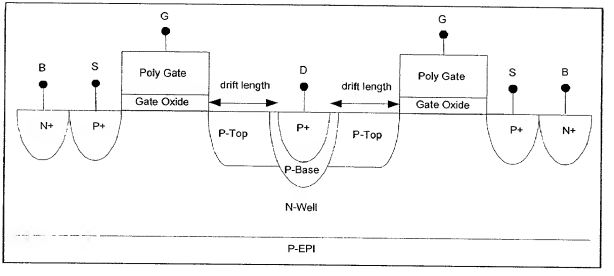

Figure 29b

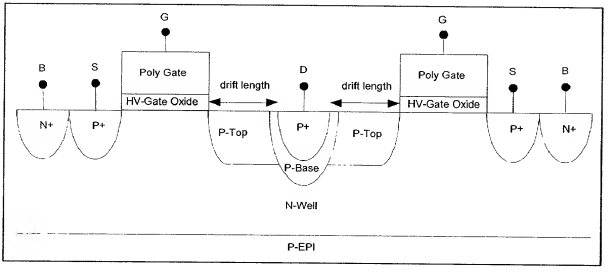

Figure 30a

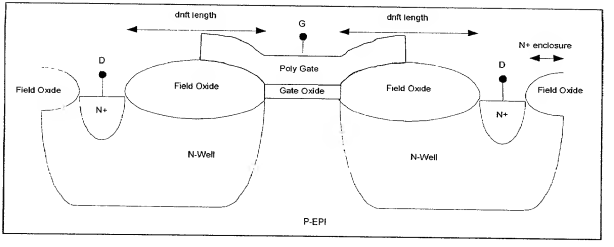

Figure 30b

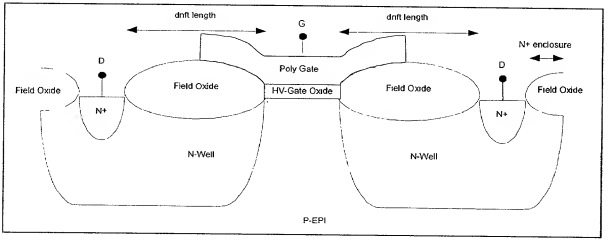

Figure 31a

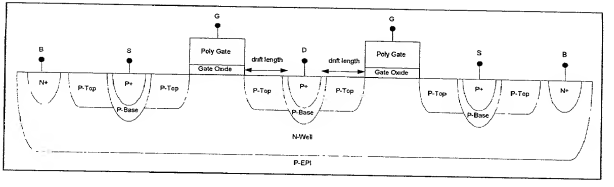

Figure 31b

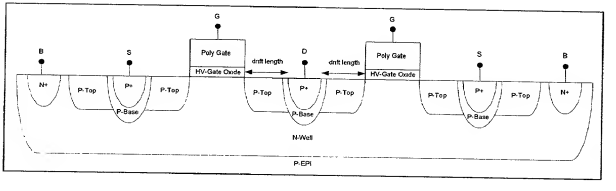

Figure 32a

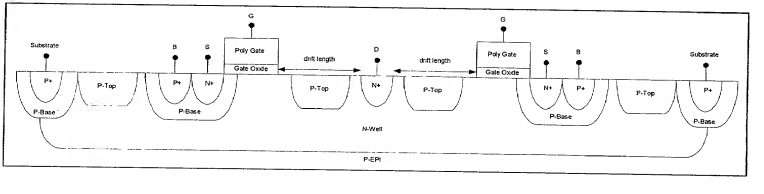

Figure 32b

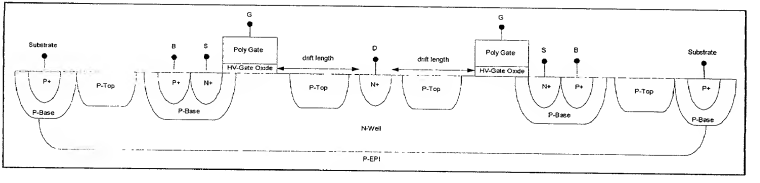

Figure 33a

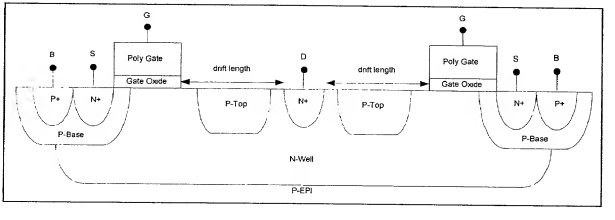

Figure 33b

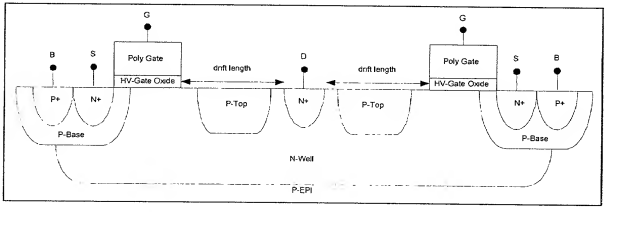

Figure 34a

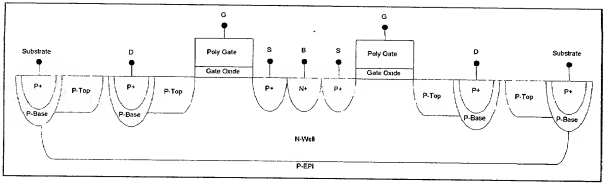

Figure 34b

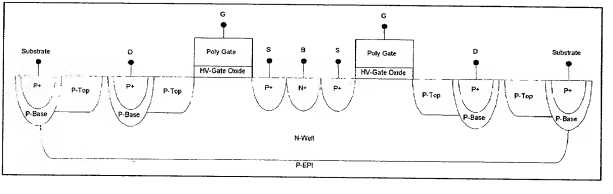

Figure 35a

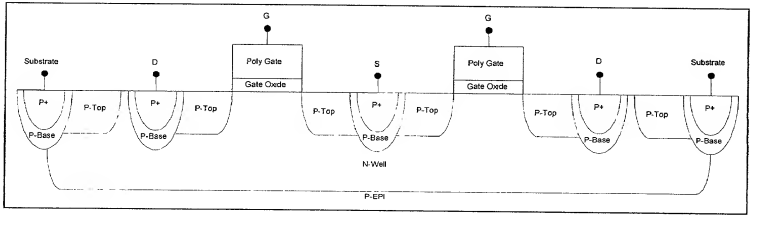

Figure 35b

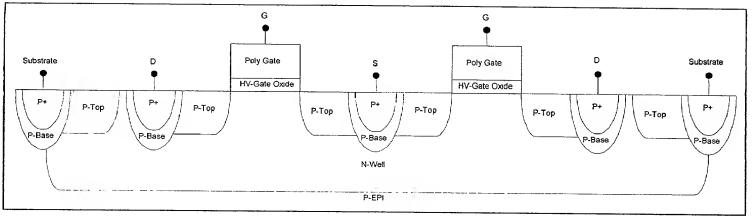

Figure 36

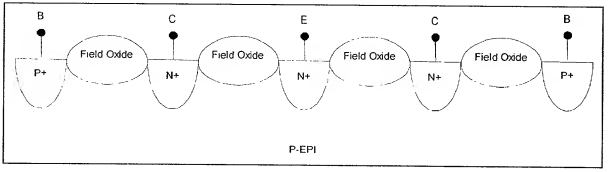

Figure 37

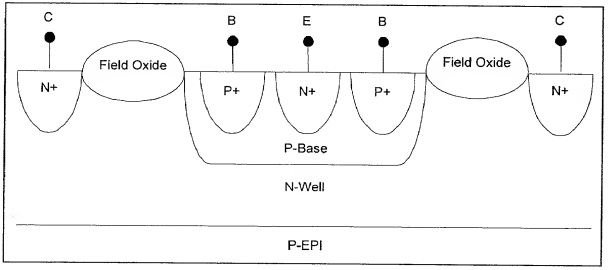

Figure 38

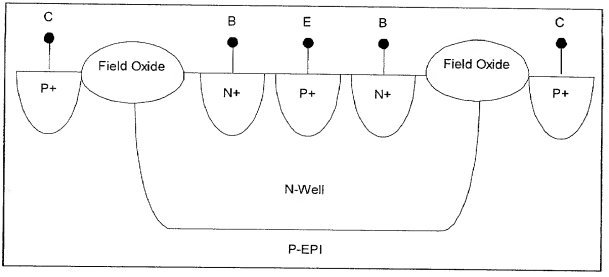

Figure 39

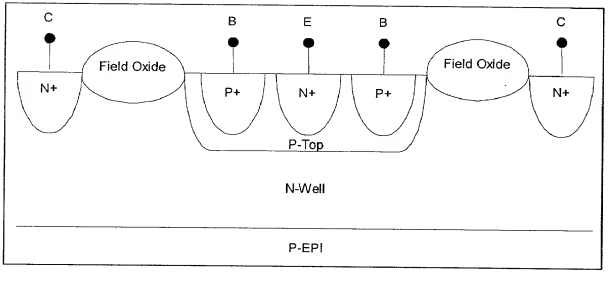

Figure 40

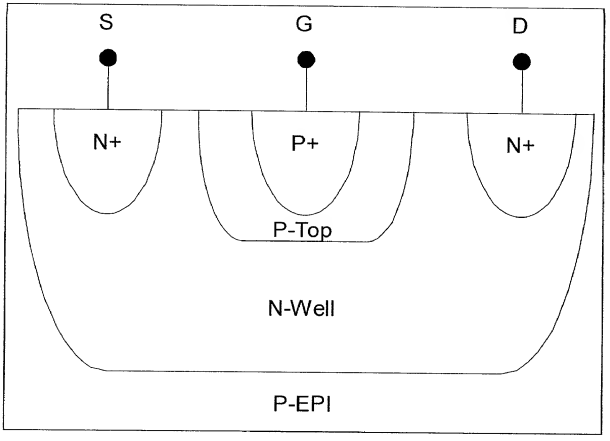

Figure 41a

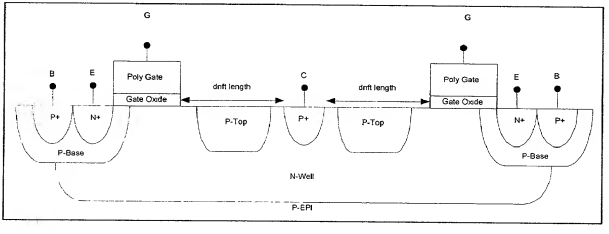

Figure 41b

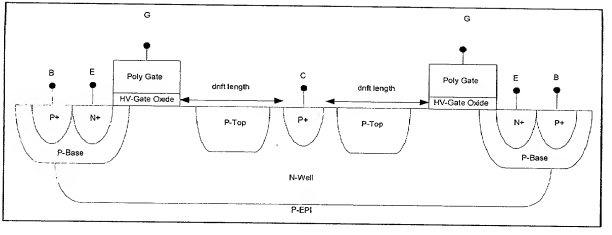
G
G
B
E
Poly Gate
HV-Gate Oxide
drift length
C
drift length
Poly Gate
HV-Gate Oxide
E
B
P+
N+
P-Base
P-Top
P+
P-Top
N+
P+
P-Base
N-Well
P-EPI

Figure 42

Active Component	Maximum Gate Voltage (V)	Maximum Drain Voltage (V)	
The standard N-MOSFET of **Figure 19a**	15	5.5	
The standard N-MOSFET of **Figure 19b**	40	5.5	
The standard P-MOSFET of **Figure 20a**	15	5.5	
The standard P-MOSFET of **Figure 20b**	40	5.5	
The standard Junction isolated N-MOSFET of **Figure 21a**	15	5.5	
The standard Junction isolated N-MOSFET of **Figure 21b**	40	5.5	
The mid-voltage single extended N-MOSFET of **Figure 22a**	15	40	
The mid-voltage single extended N-MOSFET of **Figure 22b**	40	40	
The mid-voltage single extended P-MOSFET of **Figure 23a**	15	40	
The mid-voltage single extended P-MOSFET of **Figure 23b**	40	40	
The mid-voltage double extended N-MOSFET of **Figure 24a**	15	40	
The mid-voltage double extended N-MOSFET of **Figure 24b**	40	40	
The mid-voltage double extended P-MOSFET of **Figure 25a**	15	40	
The mid-voltage double extended P-MOSFET of **Figure 25b**	40	40	
The mid-voltage single extended N-LDMOSFET of **Figure 26a**	15	75	
The mid-voltage single extended N-LDMOSFET of **Figure 26b**	40	75	
The mid-voltage floating source N-LDMOSFET of **Figure 27a**	15	75	
The mid-voltage floating source N-LDMOSFET of **Figure 27b**	40	75	
The high-voltage single extended N-MOSFET of **Figure 28a**	15		
100			
The high-voltage single extended N-MOSFET of **Figure 28b**	40		
100			
The high-voltage single extended P-MOSFET of **Figure 29a**	15		
100			
The high-voltage single extended P-MOSFET of **Figure 29b**	40		
100			
The high-voltage double extended N-MOSFET of **Figure 30a**	15		
100			
The high-voltage double extended N-MOSFET of **Figure 30b**	40		
100			
The high-voltage double extended P-MOSFET of **Figure 31a**	15		
100			
The high-voltage double extended P-MOSFET of **Figure 31b**	40		
100			
The high-voltage double extended N-LDMOSFET of **Figure 32a**	15		
325			
The high-voltage double extended N-LDMOSFET of **Figure 32b**	40		
325			
The very-high-voltage single extended N-LDMOSFET of **Figure 33a**	15		
600			
The very-high-voltage single extended N-LDMOSFET of **Figure 33b**	40		
600			
The very-high-voltage single extended P-MOSFET of **Figure 34a**	15		
325			
The very-high-voltage single extended P-MOSFET of **Figure 34b**	40		
325			
The very-high-voltage double extended P-MOSFET of **Figure 35a**	15		
325			

The very-high-voltage double extended P-MOSFET of **Figure 35b**	40	325
The lateral NPN bipolar transistor of **Figure 36**	-	15
The high-voltage vertical NPN bipolar transistor of **Figure 37**	-	40
The high-voltage vertical PNP bipolar transistor of **Figure 38**	-	55
The very-high-gain vertical NPN bipolar transistor of **Figure 39**	-	3.3
The high-voltage N-JFET of **Figure 40**	600	600
The very high-voltage LIGBT of **Figure 41a**	15	600
The very high-voltage LIGBT of **Figure 41b**	40	600

Figure 43

Junction	Typical Sheet Resistance	Typical Breakdown Voltage
P+ / N-Well	65 Ohms/sq.	20 Volts
N+ / P-Substrate	50 Ohms/sq.	25 Volts
P-Top / N-Well	14 kOhms/sq.	40 Volts
P-Base / N-well	1.75 kOhms/sq.	45 Volts
N-Ext. / P-Substrate	4 kOhms/sq.	45 Volts
N-Well / P-Substrate	1.5 kOhms/sq.	150 Volts
N-Well / P-Top / P-Substrate (RESURF)	-	650 Volts